

# Future Fossil Fuel Usage & Carbon Capture Technologies

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## Executive summary

- (1) There is an **urgent need for full-chain demonstration** of carbon capture and storage (CCS)
- (2) There is a **need to reduce the cost of capture** technologies, i.e., by minimising the efficiency penalty imposed on a power/industrial process with CO<sub>2</sub> capture
- (3) **CCS is not just a synonym for clean coal**, i.e., the technology can also target industrial emissions
- (4) The major barrier for the technology are **social and political barriers**

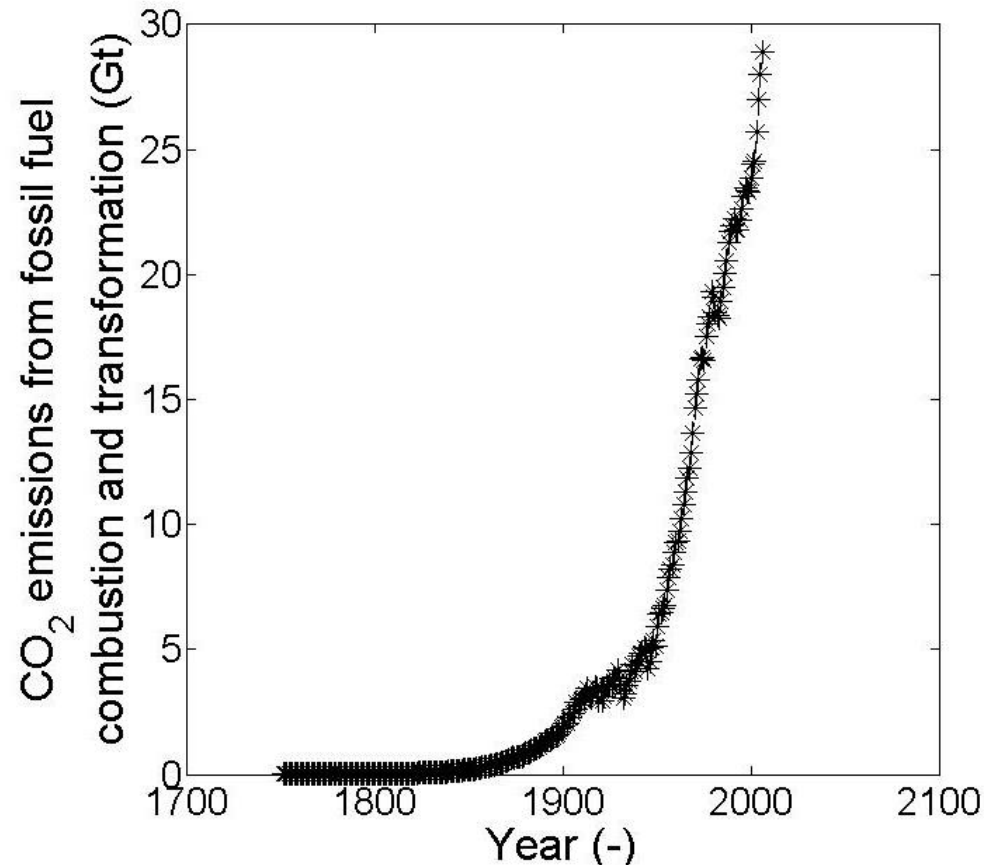
## Why CCS?

CCS, alongside increased renewable sources, energy efficiency, nuclear and lifestyle changes, is a critical to mitigate against climate change

Today all major economies are underpinned by the use of fossil fuels

Figure: CO<sub>2</sub> emissions from the combustion of fossil fuels, excluding use in cement industry

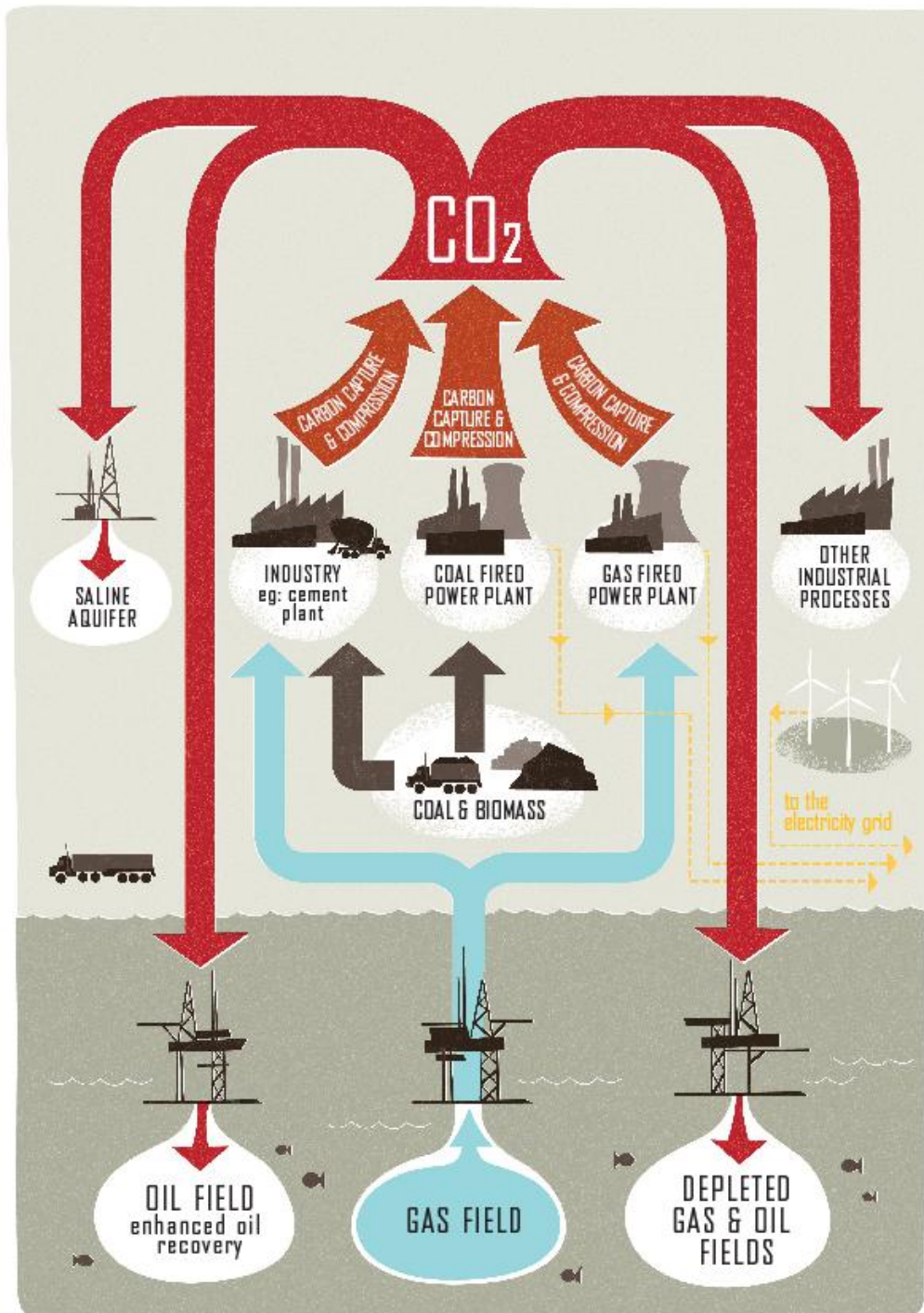
Boden T, Marland G Andres RJ. Carbon Dioxide Information Analysis Centre Oak Ridge National Laboratory, Oak Ridge, Tennessee



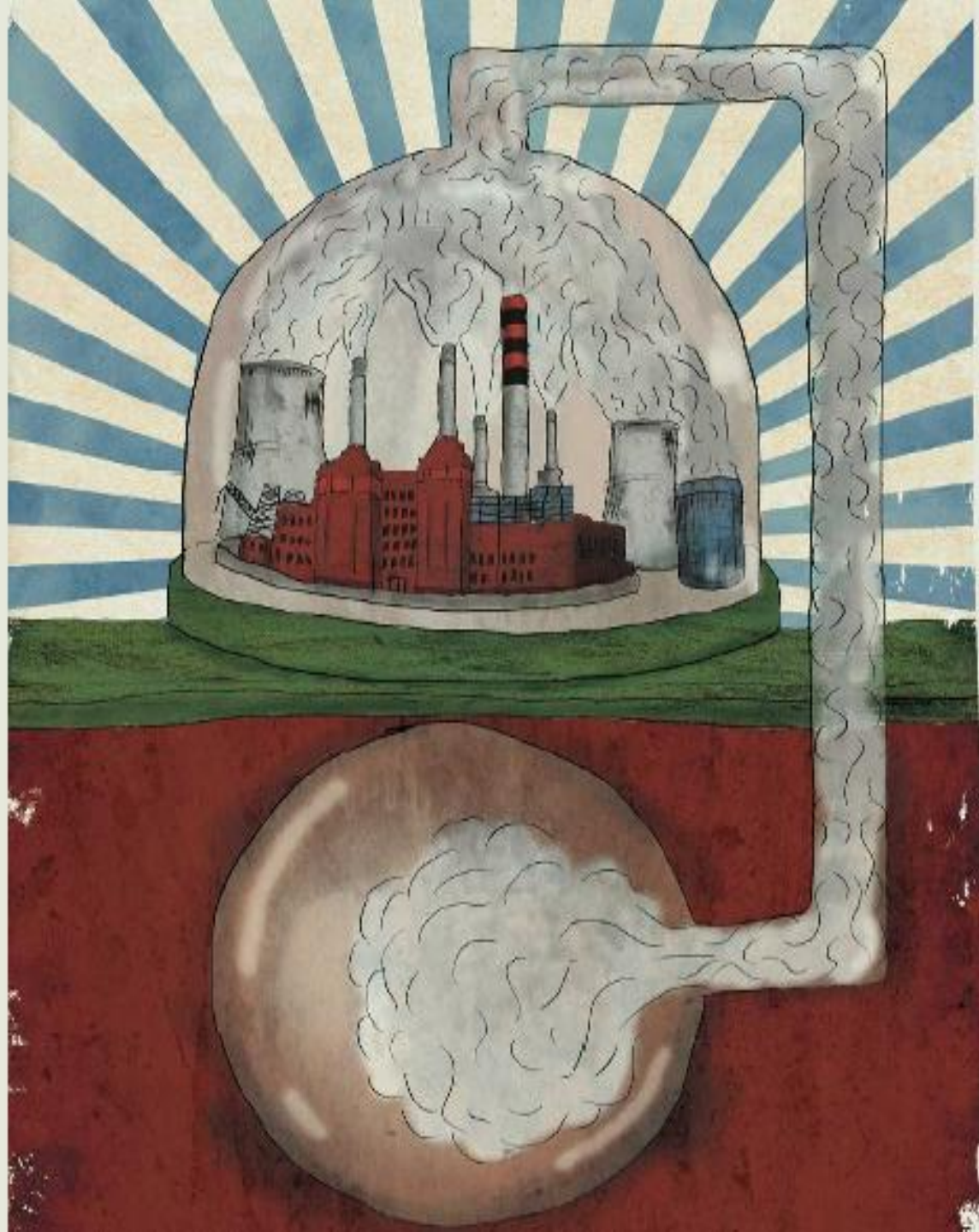
**“What is  
CCS?”**

**&**

**“Why CCS is  
not just a  
synonym for  
clean coal?”**

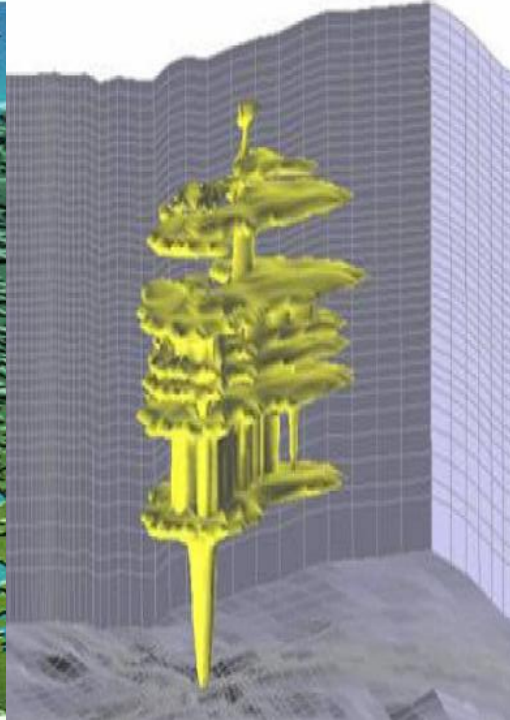
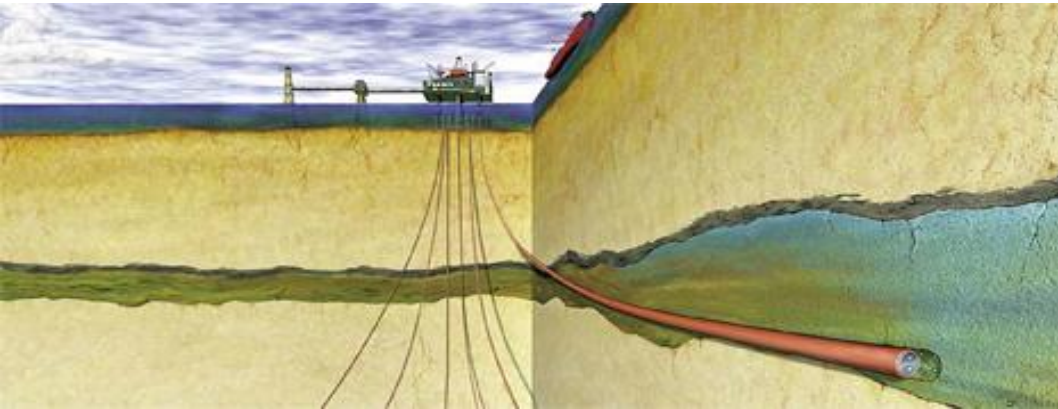


**Public acceptance  
is the major barrier  
for the deployment  
CCS**



Cartoon from  
Nature News  
Feature, Vol. 454,  
August 2008

# Storage



**UK emissions  
530 Mt CO<sub>2</sub>/year  
(2008) => 55  
years storage  
capacity**

**Storage  
capacity is  
plentiful if saline  
aquifers prove  
to be viable**

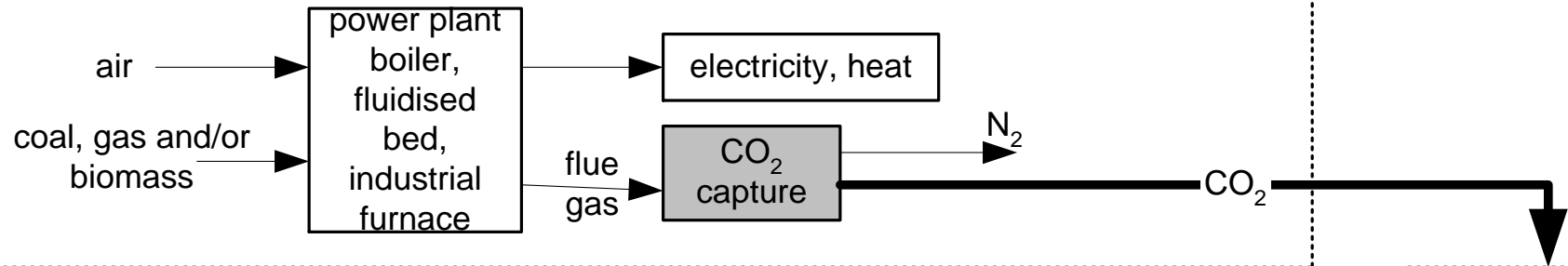
## **Sleipner (North sea)**

14 years operating experience,  
10 million tonnes stored (2008)

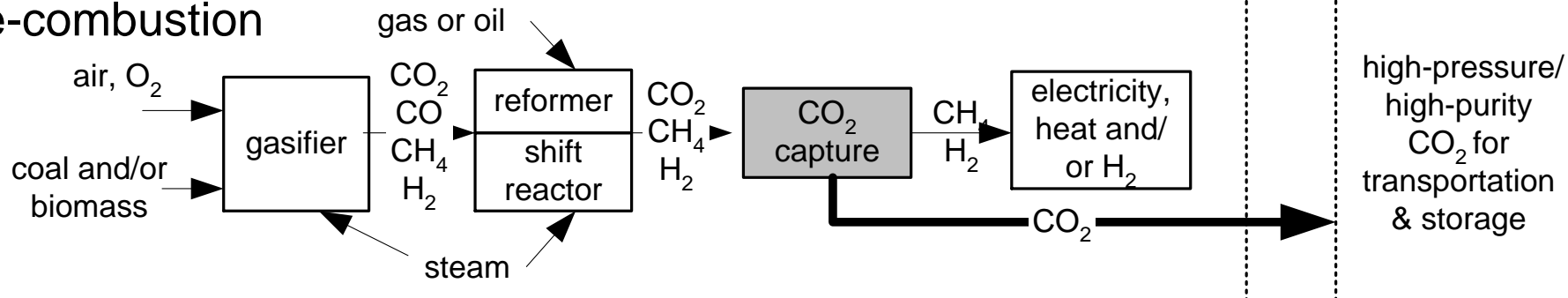
<http://www.statoil.com/en/newsandmedia/news/2008/>; Espie, T Technology development for CCS, BP, presentation at UK APGTF, 2010

# Technology options

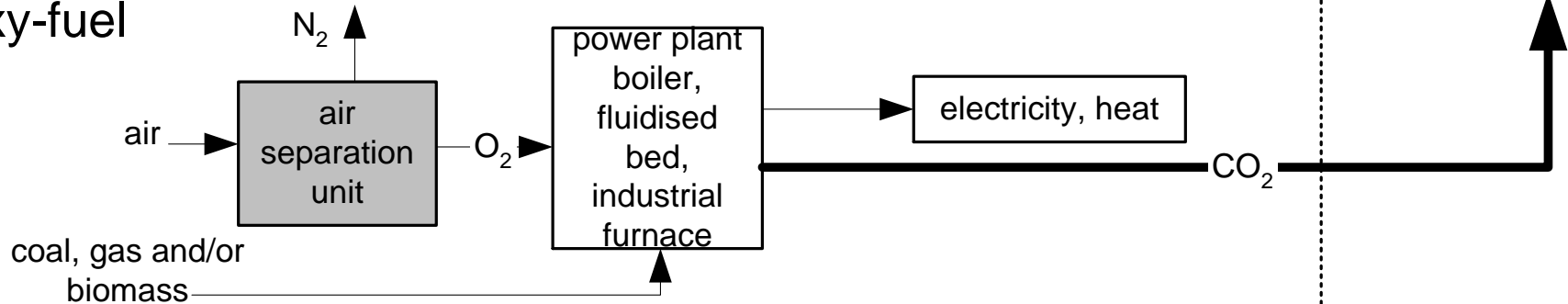
## post-combustion



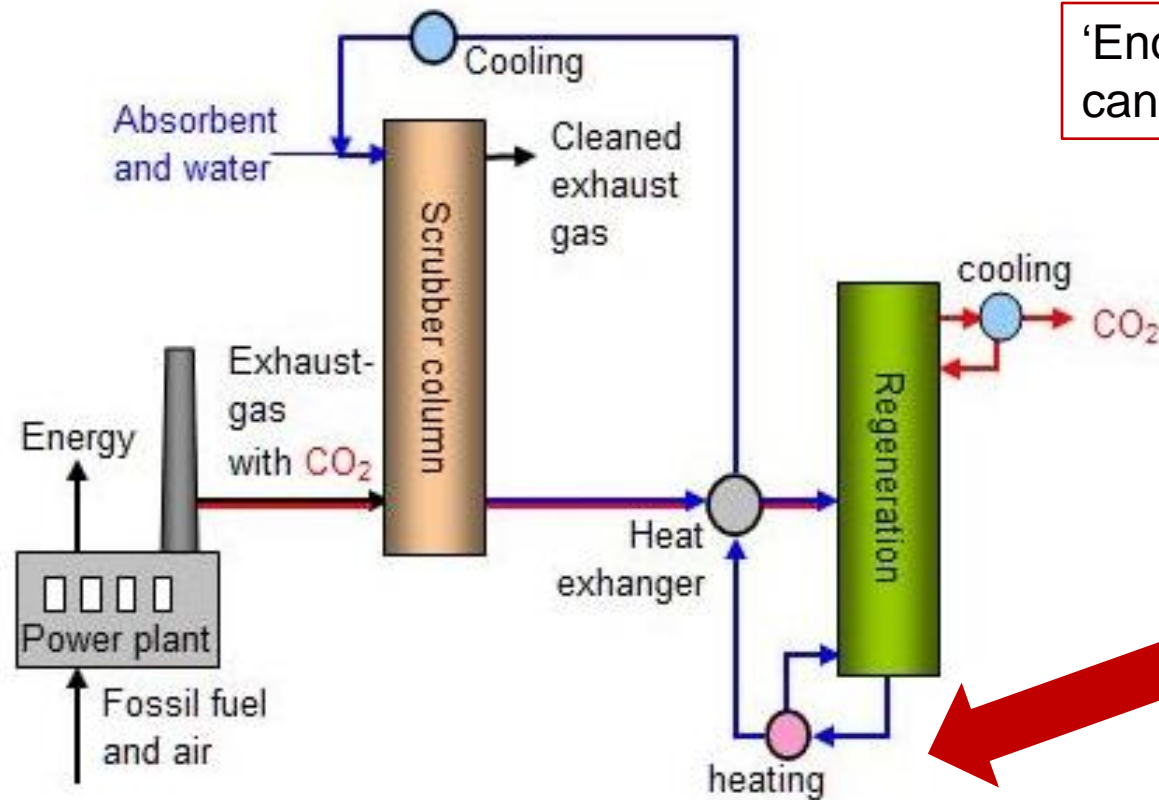
## pre-combustion



## oxy-fuel



# Post-combustion capture

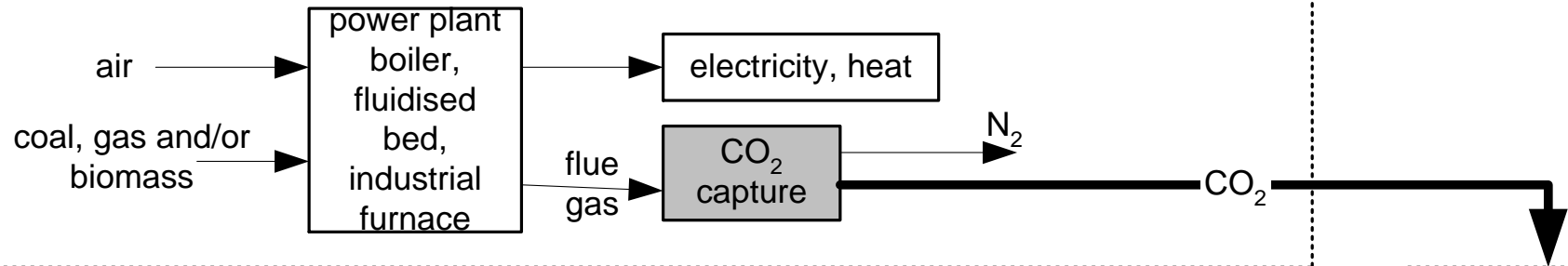


'End of pipe technology',  
can be retrofitted

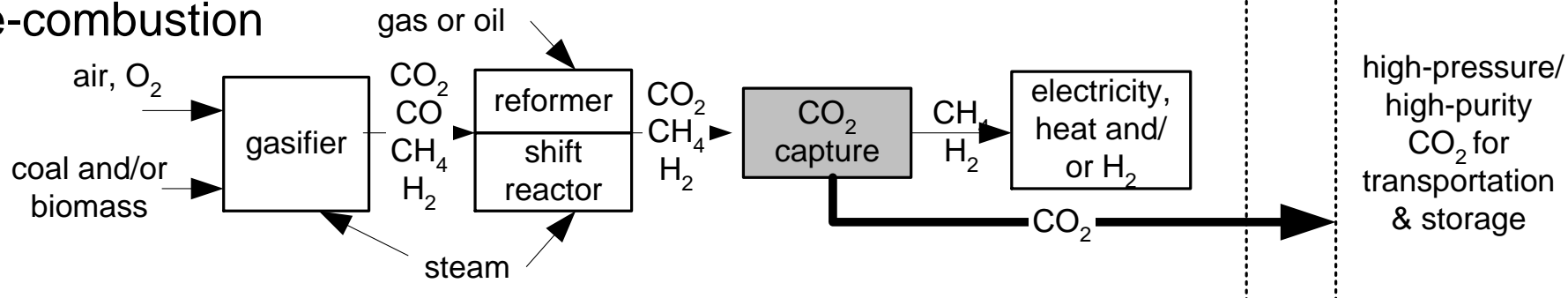
Heat input for  
regeneration of  
solvent accounts  
for decrease in  
process /cost  
efficiency

# Technology options

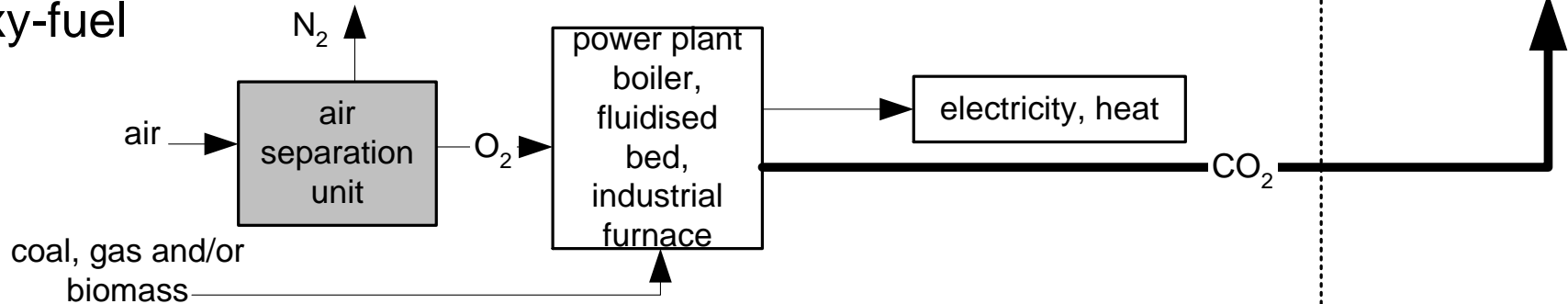
## post-combustion



## pre-combustion



## oxy-fuel



high-pressure/  
high-purity  
CO<sub>2</sub> for  
transportation  
& storage



# Demonstration

<http://www.bellona.org/ccs/ccs/>



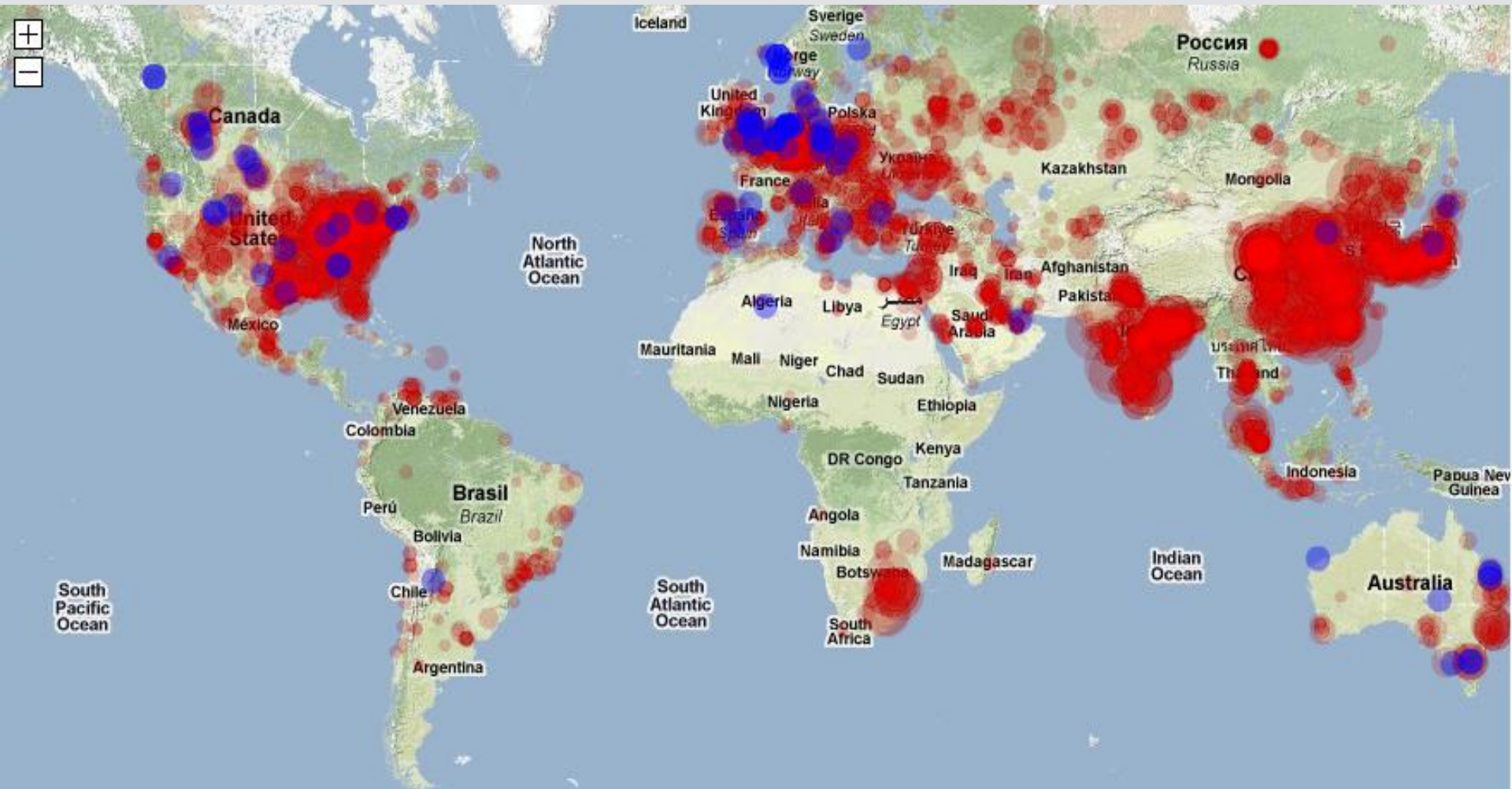
# Demonstration



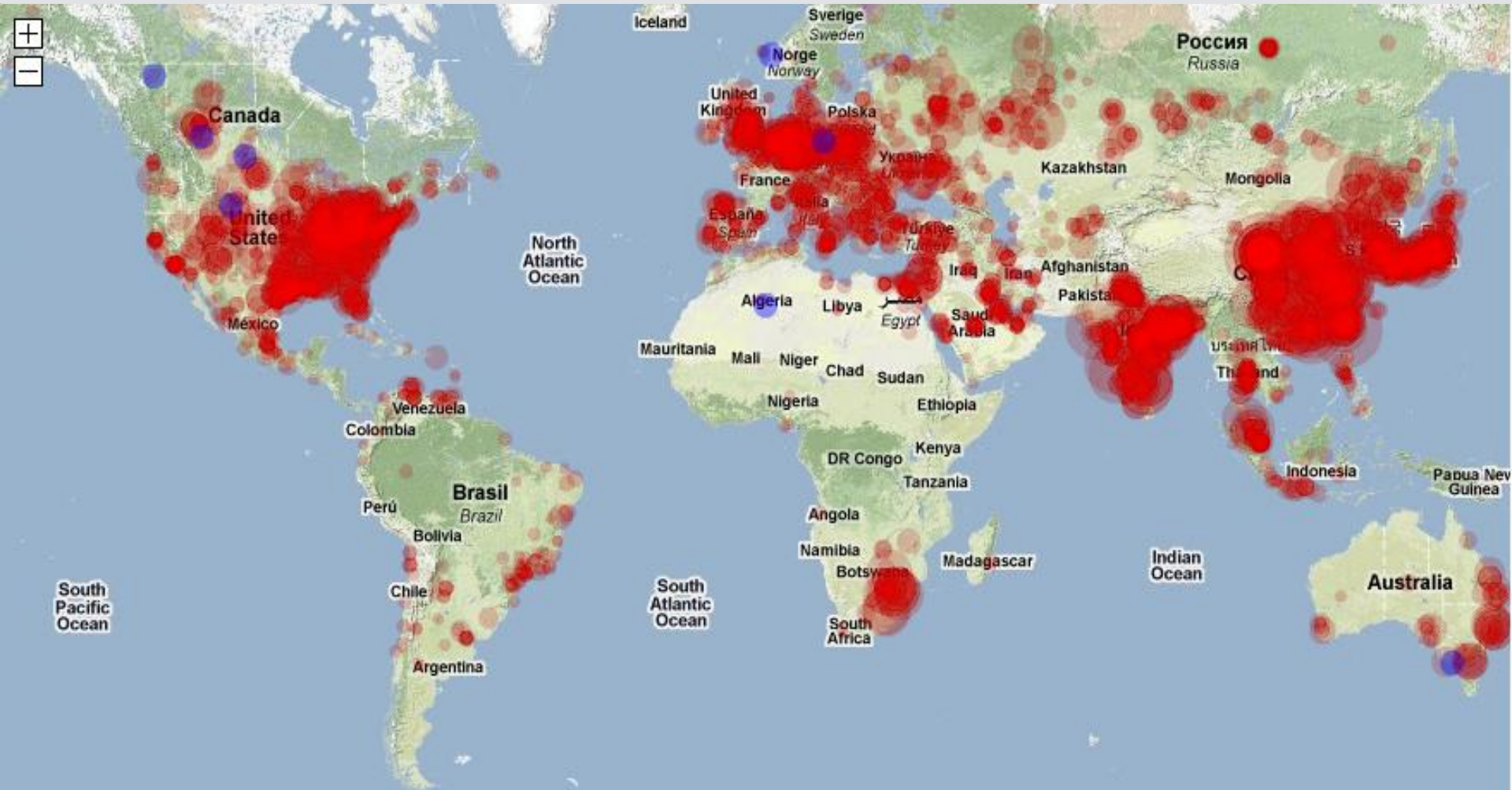
# Demonstration

CCS projects: possible, speculative,  
operational

<http://www.bellona.org/ccs/ccs/>



# Demonstration



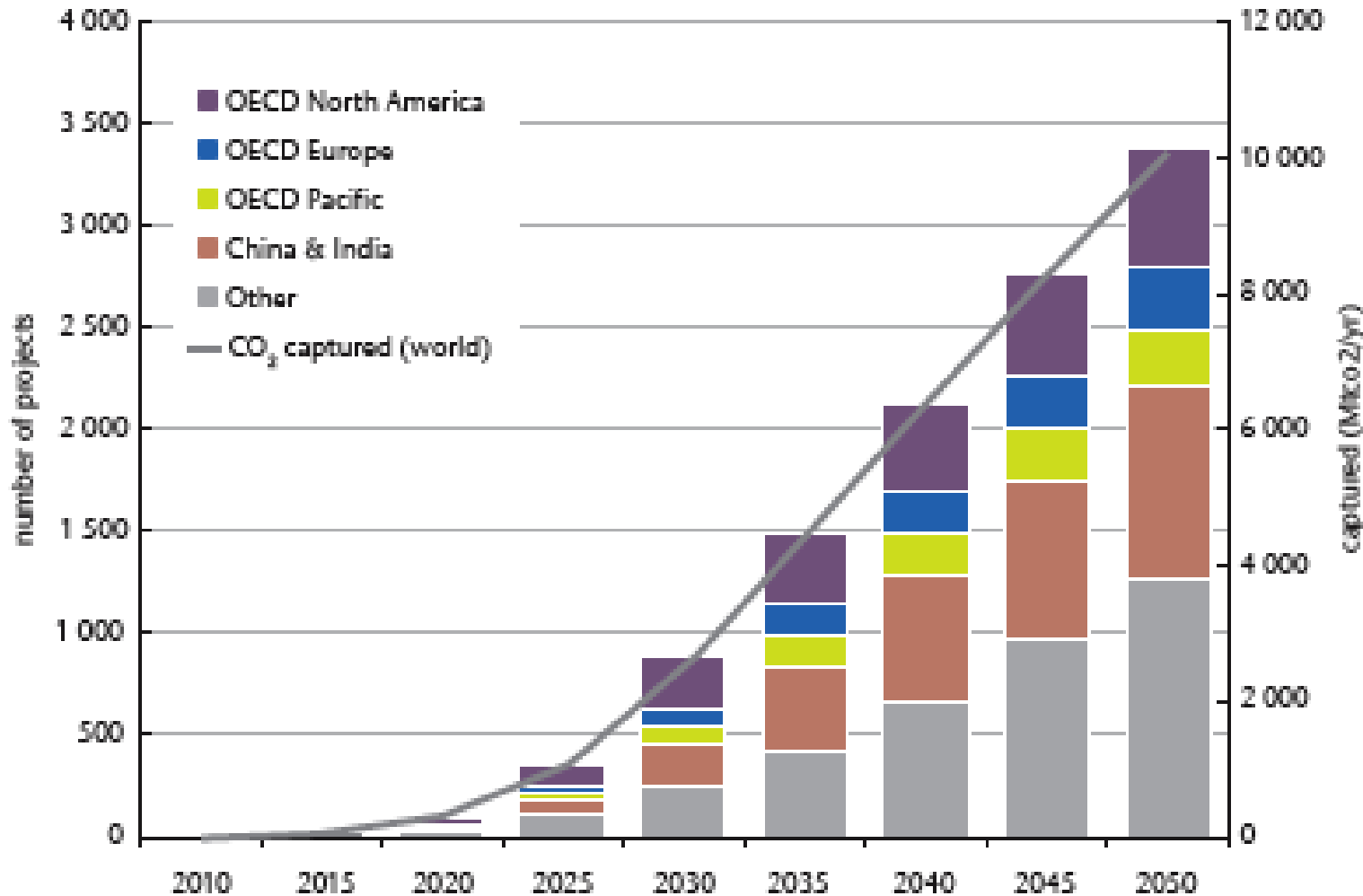
## CCS in UK

Project	Technology	Funding	Timing
<b>Longannet</b> (Scottish Power)	300 MWe Post-combustion capture, transport and storage	Awarded FEED contracts, CCS competition	Planned for 2014
<b>Kingsnorth</b> (E.On)	300-400 MWe Post-combustion capture, transport and storage	Awarded FEED contracts, CCS competition	Investment decision to be reviewed in 2016
<b>Hatfield</b> (Powerfuel Power Ltd)	450 MWe IGCC capture, transport and storage	18 0M (EUR) EC funding EEPR	Planned for 2015

No new  
coal  
without  
CCS

4 full-  
scale, full  
chain  
demos

# Global deployment of CCS , IEA CCS roadmap



**100 by  
2020  
&  
3400 by  
2050**

**A lot of  
work to  
do!**

IEA, technology  
Roadmap, CCS,  
2010

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